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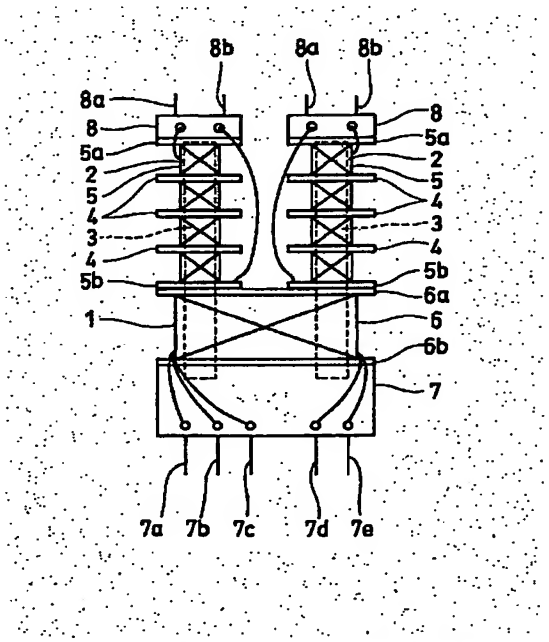
(54)【発明の名称】　インバータトランス

(57)【要約】
【課題】　複数の冷陰極放電ランプを点灯する開磁路構造の（二次側巻線に接続された複数の冷陰極放電ランプ間での放電動作のばらつきのない）インバータトランスの小型化、低コスト化を図る。
【解決手段】　１つの一次側巻線１に対して同特性で電磁気的に結合する別個独立の複数の棒状磁芯３，３に各々二次側巻線２を巻回することで、相互に独立して機能し、かつ電磁気的に等価な複数の二次側巻線２，２と開磁路構造とを得、上記ランプの数に応じて、一，二次側巻線共に増加するのではなく、一次側巻線１は共通で二次側巻線のみ増加するだけの構成とする。



【特許請求の範囲】
【請求項１】　直流を交流に変換するインバータ回路内にあって、一次側に入力された交流電圧を昇圧又は降圧して二次側に出力するインバータトランスにおいて、複数の二次側巻線と、この複数の二次側巻線に共通の一次側巻線とを備え、各二次側巻線は、前記共通の一次側巻線に相互に均等の特性をもって電磁気的に結合する、各々別個独立に形成された複数の棒状磁芯に各別に巻回されることを特徴とするインバータトランス。
【請求項２】　二次側巻線は、各々棒状磁芯の軸方向に沿って巻回され、かつ、その軸方向で複数セクションに分割され、各セクション間には仕切り板を備えることを特徴とする請求項１に記載のインバータトランス。
【請求項３】　各棒状磁芯は、Ｌ字形に形成され、その一辺側に二次側巻線が巻回され、他辺側全体で一次側巻線と電磁気的に結合するよう当該一次側巻線に対して位置決め固定されることを特徴とする請求項１又は２に記載のインバータトランス。
【請求項４】　一次側巻線と複数の二次側巻線、若しくは複数の二次側巻線のみを覆う位置には、当該二次側巻線の巻回軸方向に沿って磁性板が近接、配置されることを特徴とする請求項１～３のいずれかに記載のインバータトランス。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、液晶ディスプレイの画面照明用光源を点灯するインバータ回路用として好適なインバータトランスに関するものである。
【０００２】
【従来の技術】近年、パーソナルコンピュータ等のディスプレイ装置として液晶ディスプレイ（以下、ＬＣＤと記す。）が広く使用されるようになってきたが、このＬＣＤはバックライト等と称する画面照明用の光源を必要とする。また、このようなＬＣＤの画面を高輝度に保つために、上記光源として４本以上の冷陰極放電ランプ（以下、ＣＦＬと略記する。）を使用し、それらを同時に放電、点灯させることがある。
【０００３】一般に、この種のＣＦＬの放電、点灯には、１２Ｖ程度の直流入力電圧からロイヤー（ROYER）発振回路を用いてその二次側、換言すればインバータトランスの二次側に、放電開始時に６０ｋＨｚ、１６００Ｖ程度の高周波電圧を発生させるインバータ回路が用いられている。このインバータ回路は、ＣＦＬ放電後にはインバータトランスの二次側電圧をＣＦＬの放電維持に必要な６００Ｖ程度の電圧まで下げるように制御している。この電圧制御は、通常、ＰＷＭ（pulse width modulation）制御で行われている。
【０００４】このようなインバータ回路に使用されるインバータトランスとしては、従来から、磁芯に棒状コアを用いた開磁路構造のものと、磁芯を閉磁路構造としたものとがある。
【０００５】図９は、開磁路構造のインバータトランスの等価回路を示す図である。この図において、Ｔｉは損失がない１：ｎの昇圧理想トランス、Ｌｌは漏洩インダクタンス、Ｌｓは二次側巻線のインダクタンスである。図示開磁路構造のインバータトランスでは、接続されるＣＦＬが１本の場合は漏洩インダクタンスＬｌ，Ｌｌがバラストインダクタンスの役割を果たし、インバータトランス出力端子Ｔの電圧降下もなく、正常に放電する。しかし、ＣＦＬを２本接続すると、漏洩インダクタンスＬｌ，Ｌｌが大きいことから、何れか一方のＣＦＬが先に放電すると、出力端子Ｔの電圧が降下して他方のＣＦＬが放電不能となる。
【０００６】磁芯に棒状コアを用いた開磁路構造のインバータトランスは、例えば図１０に示すように構成されており、磁芯を閉じた形状、例えば四角形に形成し、その磁芯に巻線を巻回させなければならない閉磁路構造のインバータトランス（図示せず）に比べて構造簡単である。しかし、開磁路構造であることに変わりはなく、上述したＣＦＬ放電不能の現象を避け得ないので、ＣＦＬ１本に対して１つのインバータトランスが必要になる。
【０００７】したがって、前述したような高輝度対応のＬＣＤでの画面照明におけるように、４本あるいはそれ以上の本数のＣＦＬを用いる場合には、４つ以上のインバータトランスが必要になる。このため、インバータトランス全体が大型化すると共に、コストが上昇するという問題があった。
【０００８】他方、磁芯を閉磁路構造としたものにあっては、１つのインバータトランスに２本以上のＣＦＬを接続し、それらのＣＦＬ全てを放電させることが可能である。しかしこの場合、何れかのＣＦＬが放電し、そのＣＦＬの内部インピーダンスの低下により放電電流が流れ、負荷電流が増加すると、閉磁路構造では漏洩インダクタンスが小さいとはいえ、インバータトランスの出力端子電圧は低下する。このため、他のＣＦＬの放電条件に影響を与え、各ＣＦＬの放電動作にばらつきを生じさせることがある。
【０００９】また、ＣＦＬのインピーダンスは負性抵抗特性をもつので、１つのＣＦＬが放電、点灯すると、急激にＣＦＬのインピーダンスが減少して電流が激増し、巻線の断線等、インバータトランスの損傷を生じさせることもある。
【００１０】閉磁路構造のインバータトランスの出力端子電圧の低下が他のＣＦＬの放電条件に影響を与えることの対処法としては、図１１に示すように、出力端子Ｔと各ＣＦＬ間にバラストコンデンサＣｂを挿入する方法がある。しかしこの方法では、挿入したバラストコンデンサＣｂにより電圧、電流に位相差が生じ、電力効率を著しく低下させると共に、部品数の増加、コスト上昇を招来させる。

【００１１】
【発明が解決しようとする課題】上述したように従来のインバータトランスでは、開磁路構造のものにあっては、インバータトランスの個数がＣＦＬの本数と１対１の関係で増えてゆき、インバータトランス全体として大型化し、またコストが上昇するという問題点があった。
【００１２】また、閉磁路構造のものにあっては、１つのインバータトランスで複数本のＣＦＬを放電させ得るが、ＣＦＬ間で放電動作にばらつきを生じさせたり、過電流によりインバータトランスを損傷させる等の問題点があった。
【００１３】ＣＦＬ間での放電動作のばらつきに関しては、バラストコンデンサＣｂを各ＣＦＬに直列に挿入するという対処法があるが、これによると電力効率の低下、部品数やコストの増大という新たな問題点を生じさせた。
【００１４】本発明は、開磁路構造でありながら、すなわち閉磁路構造での上記問題点を全て解消できる上に、ＣＦＬの本数と１対１の関係での個数増加がなく、したがって全体構成も従来の開磁路構造のものに比べて小型化でき、またコストの上昇も抑えることのできるインバータトランスを提供することを目的とする。
【００１５】
【課題を解決するための手段】上記目的を達成するために、請求項１に記載の発明は、直流を交流に変換するインバータ回路内にあって、一次側に入力された交流電圧を昇圧又は降圧して二次側に出力するインバータトランスにおいて、複数の二次側巻線と、この複数の二次側巻線に共通の一次側巻線とを備え、各二次側巻線は、前記共通の一次側巻線に相互に均等の特性をもって電磁気的に結合する、各々別個独立に形成された複数の棒状磁芯に各別に巻回されることを特徴とする。
【００１６】請求項２に記載の発明は、請求項１に記載の発明において、二次側巻線が、各々棒状磁芯の軸方向に沿って巻回され、かつ、その軸方向で複数セクションに分割され、各セクション間には仕切り板を備えることを特徴とする。
【００１７】請求項３に記載の発明は、請求項１又は２に記載の発明において、各棒状磁芯は、Ｌ字形に形成され、その一辺側に二次側巻線が巻回され、他辺側全体で一次側巻線と電磁気的に結合するよう当該一次側巻線に対して位置決め固定されることを特徴とする。
【００１８】請求項４に記載の発明は、請求項１～３のいずれかに記載の発明において、一次側巻線と複数の二次側巻線、若しくは複数の二次側巻線のみを覆う位置には、当該二次側巻線の巻回軸方向に沿って磁性板が近接、配置されることを特徴とする。
【００１９】請求項１に記載の発明では、相互に均等の特性をもつ複数の二次側巻線を備え、一次側巻線はこれら複数の二次側巻線に共通のものとすることで、一次側巻線及び二次側巻線共に複数（同数）備える従来のインバータトランスに比べて全体構成が小型化され、コストの上昇も抑えられる。また、本発明では開磁路構造をとっているので、閉磁路構造での問題点、例えば各二次側巻線に接続されたＣＦＬ間での放電動作のばらつきや、バラストコンデンサを付加することによる電力効率の低下や部品数の増大等の問題点は全て解消される。
【００２０】請求項２に記載の発明では、各セクション間の仕切り板が、必要とする沿面距離の保持に寄与し、沿面放電阻止に機能する。
【００２１】請求項３に記載の発明では、一辺側に二次側巻線が巻回されたＬ字形の棒状磁芯の他辺側全体で一次側巻線と電磁気的に結合する。これにより、二次側巻線が受ける一次側巻線からの磁束量は、単に棒状磁芯の端部で一次側巻線と電磁気的に結合する場合に比べて増大し、高出力化される。
【００２２】請求項４に記載の発明では、一次側巻線と複数の二次側巻線、若しくは複数の二次側巻線のみを覆う位置に近接、配置される磁性板の設定により、漏洩インダクタンスの大きさが調整可能となる。
【００２３】
【発明の実施の形態】以下、本発明の実施の形態を図面に基づき説明する。図１は、本発明によるインバータトランスの第１の実施形態を示す全体構成図である。本発明のインバータトランスは、後述するように、棒状磁芯が用いられ、その棒状磁芯に二次側巻線が巻回された開磁路構造をもつものである。図１において、１は一次側巻線、２は二次側巻線である。二次側巻線２は複数、ここでは２つ備え、一次側巻線１を共通の一次側巻線として各々この一次側巻線１に電磁気的に結合している。
【００２４】すなわち各二次側巻線２，２は、軟磁性材料であるフェライト等からなり、平行に配置された棒状磁芯３，３に各別に巻回されており、棒状磁芯３，３は共通の一次側巻線１と電磁気的に結合している。
【００２５】この場合、各棒状磁芯３，３は、一次側巻線１と相互に均等の特性をもって電磁気的に結合しており、また、各々別個独立に形成されている。したがって、各二次側巻線２，２も、相互に独立した二次側巻線として機能し、かつ電磁気的に等価なものとなっている。
【００２６】ここで、上記二次側巻線２，２は、棒状磁芯３，３の軸方向に沿って巻回されるが、高電圧を発生するため、その軸方向で複数セクションに分割され、各セクション間には絶縁性の仕切り板４が設けられ、沿面放電の阻止に必要な沿面距離が保持されている。
【００２７】各二次側巻線２は、実際には筒状のボビン５の外周に巻回されており、棒状磁芯３はそのボビン５の内方に挿通されている。一次側巻線１も筒状のボビン（一次側巻線用ボビン）６に巻回され、この一次側巻線用ボビン６は、その内方に棒状磁芯３，３の図中下端部

分が挿入可能の内径をもって形成されている。また、各ボビン５，６の両端面には、鍔板５ａ，５ｂ；６ａ，６ｂが設けられている。

【００２８】棒状磁芯３，３は、一次側巻線１と相互に均等の特性をもって電磁気的に結合するように、一次側巻線用ボビン６内方の電磁気的に同等な箇所に位置決め固定されている。また、各棒状磁芯３，３は、一次側巻線用ボビン６内に位置する部分以外の残余の部分は各々二次側巻線２，２が巻回された二次側巻線用ボビン５，５内に位置されている。これにより、上述したような二次側巻線２，２の一次側巻線１との電磁気的結合が実現されると共に、各二次側巻線２，２が電磁気的に等価なものとなされる。

【００２９】一次側巻線１の始，終端は、一次側巻線用端子台７に支持固定された端子ピン７ａ～７ｅに接続される。また、各二次側巻線２，２の始，終端は、各々二次側巻線用端子台８に支持固定された端子ピン８ａ，８ｂに接続される。上記端子台７，８は、絶縁材からなり、一，二次側巻線用ボビン５，６を介在させた、相互に最も離れた位置に各々取り付けられる。

【００３０】なお、図２は図１に示す本発明のインバータトランスから一次側巻線１及び二次側巻線２，２を除いた部分（巻線組込基体２１）を示す図、図３はその分解図で、これら図２，図３において図１と同一符号は同一部分を示す。各巻線１，２，２はこのような巻線組込基体２１に図１に示すように組み込まれる。

【００３１】上述本発明のインバータトランスにＣＦＬ（負荷）を接続した回路例を示せば図４の通りである。図４において、本発明のインバータトランス４１は、スイッチング回路４２とでインバータ回路を構成する。この構成にて、インバータトランス４１は、共通の一次側巻線１に印加された高周波電圧を昇圧し、二次側巻線２，２に接続された２つのＣＦＬに印加してそれらを放電、点灯させる。なおこの図４において、Ｌはインダクタンス、Ｒ１，Ｒ２は抵抗、Ｑ１，Ｑ２はトランジスタで、上記スイッチング回路４２を構成する。

【００３２】図５は図４中のインバータトランス４１の等価回路を示す図で、この図５において、図９と同一符号は同一又は相当部分を示す。図４に示すようにインバータ回路内に設けられた本発明のインバータトランス４１によれば、この図５に示す等価回路から分かるように、各二次側巻線２，２は、一次側巻線１を共通とするが相互に独立し、電磁気的には等価なものとなっている。すなわち、各ＣＦＬは各々別個の漏洩インダクタンスＬｌ，Ｌｌ（二次側巻線２）を介して接続された回路構成となっている。

【００３３】したがって、いずれか一方のＣＦＬが先に放電しても、他方の二次側巻線２の出力電圧（出力端子Ｔの電圧）は降下しない（他方のＣＦＬの放電条件に影響を与えない）。すなわち、バラストコンデンサＣｂ（図１１参照）を用いることなく、一方のＣＦＬの放電、点灯後に、他方のＣＦＬを正常に放電、点灯させ得る。

【００３４】なお上述実施形態では、二次側巻線２を２つ設けた場合について述べたが、これのみに限定されず、３つ以上設け、その各々にＣＦＬを接続するようにしてもよい。

【００３５】また上述実施形態では、各棒状磁芯３，３を単なる（Ｉ字形の）棒状に形成したが、これを、例えば図６に示すように各々Ｌ字形に形成してもよい。この場合、二次側巻線２はＬ字形の一辺（縦向きの辺）に巻回され、他辺（横向きの辺）全体で一次側巻線１と電磁気的に結合するよう、棒状磁芯３，３の他辺側の各端面を相互に向き合わせた状態で一次側巻線１に対して位置決め固定される。

【００３６】この構成によれば、二次側巻線２，２が受ける一次側巻線１からの磁束量は、単なる棒状の磁芯３，３の端部で一次側巻線１と電磁気的に結合する図１に示す場合に比べて増大し、高出力化される。

【００３７】更に上述実施形態、棒状磁芯３，３（二次側巻線２，２）と一次側巻線１との電磁気的結合を、各棒状磁芯３，３の下端部分を一次側巻線用ボビン６内に挿入、位置させることで行っていたが、これのみに限定されることはない。例えば、図７に示すように、一次側巻線用ボビン６内に二次側磁芯７１を挿入、位置させ、この二次側磁芯７１の端面に各棒状磁芯３，３の下端面を対向させることで上記電磁気的結合を行うようにしてもよい。

【００３８】また、棒状磁芯３の断面（横断面）形状についても円形等の特定形状に限定されることはなく、少なくともボビン５内に挿入できれば、矩形、楕円形等、任意の形状が選択可能である。通常、棒状磁芯３の断面形状とボビン５の磁芯挿入部の断面形状とは同形状になされる。

【００３９】更にまた、図８に例示するように、二次側巻線２，２を覆う位置に、当該二次側巻線２，２の巻回軸方向（図中上下方向）に沿ってフェライト等からなる磁性板８１，８１を近接、配置してもよい。この構成によれば、二次側巻線２，２近傍に配置される磁性板８１，８１の設定により、漏洩インダクタンスＬｌの大きさが調整可能となり、ＣＦＬの放電条件の調整が可能となる。

【００４０】なお図８は、図１の左方向から見た図で、磁性板８１は二次側巻線２，２の前後面を覆うように一対配置した場合を例示しているが、更に二次側巻線２，２の左右面（両側面）をも覆うように構成してもよい。この場合は、磁性板８１…の配置により二次側巻線２，２から高圧漏電が発生しないように、二次側巻線２，２との間隔等が設定される。

【００４１】また磁性板８１を、二次側巻線２，２のみ

ならず、一次側巻線１をも覆うように構成してもよい。この場合は、一次側巻線１と二次側巻線２，２とが密結合となるので、漏洩インダクタンスＬ１が極端に減少してＣＦＬの放電に影響を与えることのないように、磁性板８１による一次側巻線１を覆う範囲等が設定される。

【００４２】なお磁性板８１の断面形状も、この磁性板８１による漏洩インダクタンスＬ１の大きさ調整機能が失われなければ、どのような形状であってもよい。

【００４３】

【発明の効果】以上述べたように本発明では、複数の負荷（ＣＦＬ等）が接続されるインバータトランスにおいて、共通の一次側巻線に対して相互に均等の特性で電磁気的に結合する、各々別個独立に形成された複数の棒状磁芯を設けた。そして、この複数の棒状磁芯に各々二次側巻線を巻回することで、相互に独立して機能し、また電磁気的に等価な複数の二次側巻線を得、この複数の二次側巻線に各別に複数の負荷を接続することとした。

【００４４】これによれば、相互に影響を与えずに複数の負荷を作動させるインバータトランスが、負荷の個数と１対１の関係で増加することなく、したがって、全体構成が従来の開磁路構造のものに比べて小型で、また低コストで得られるという効果がある。

【００４５】また、本発明のインバータトランスは、二次側巻線を棒状磁芯に巻回した開磁路構造をとっているので、各二次側巻線に接続された負荷間での放電動作のばらつきや、バラストコンデンサを付加することによる電力効率の低下や部品数の増大等の閉磁路構造での問題点が全て解消できるという効果もある。

【図面の簡単な説明】

【図１】本発明によるインバータトランスの一実施形態を示す全体構成図である。

【図２】図１に示すインバータトランスの巻線組込基体を示す図である。

【図３】図２の分解図である。

【図４】図１に示すインバータトランスにＣＦＬを接続した回路例を示す図である。

【図５】図４中のインバータトランスの等価回路を示す図である。

【図６】本発明の他の実施形態（その１）を示す図である。

【図７】同じく他の実施形態（その２）を示す図である。

【図８】同じく他の実施形態（その３）を示す図である。

【図９】従来の開磁路構造のインバータトランスの等価回路を示す図である。

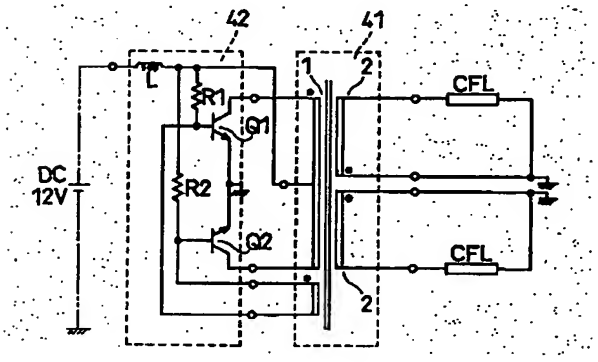
【図１０】磁芯に棒状コアを用いた従来の開磁路構造のインバータトランスを示す図である。

【図１１】閉磁路構造のインバータトランスにバラストコンデンサを接続して２つのＣＦＬを放電可能とした回路を示す図である。

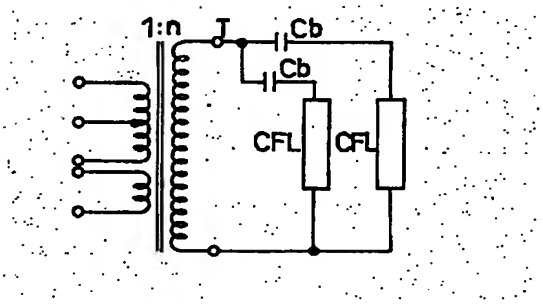
【符号の説明】

１　一次側巻線
２　二次側巻線
３　棒状磁芯
４　仕切り板
４１　インバータトランス
４２　スイッチング回路
８１　磁性板
ＣＦＬ　冷陰極放電ランプ（負荷）
0

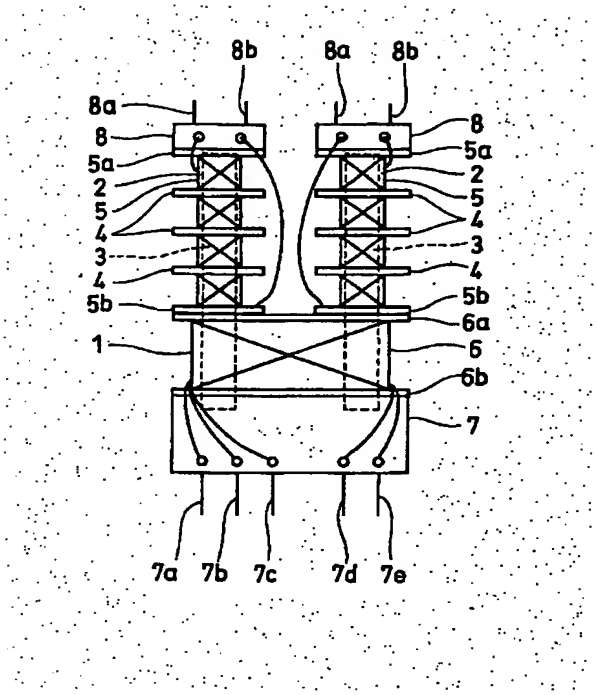
【図４】



【図１１】



【図1】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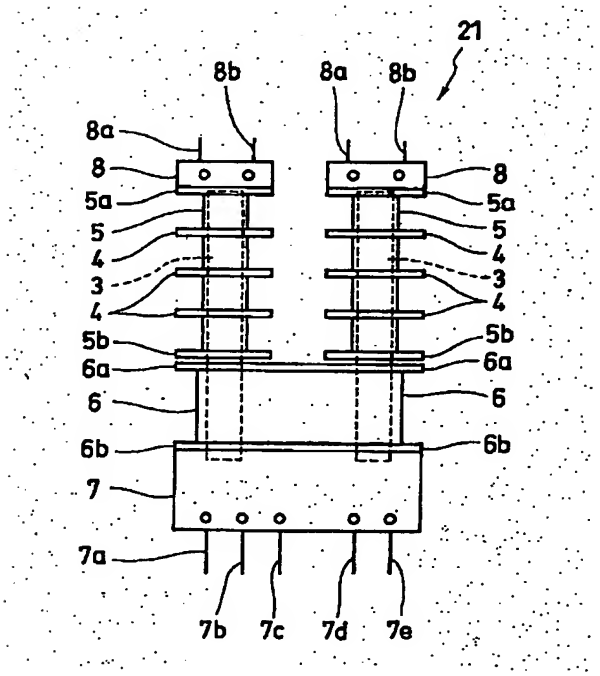
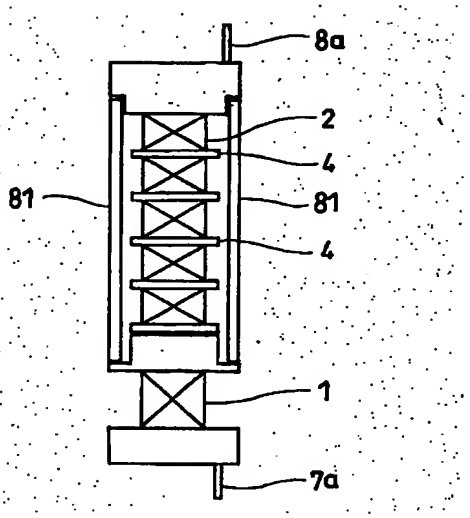
8a
8b
8a
8
5a
2
5
4
3
4
5b
1
6a
6
6b
7
7a
7b
7c
7d
7e

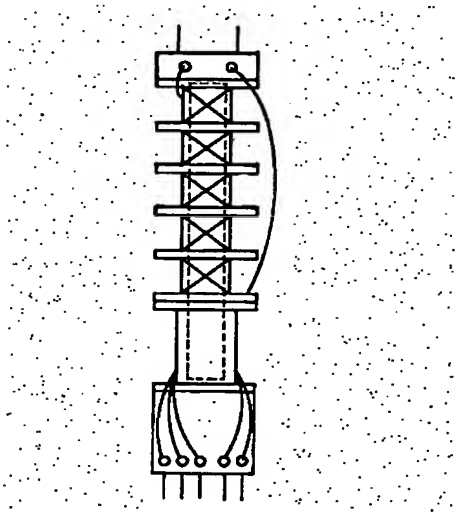
【図2】


21
8b
8a
8b
8a
8
5a
5
4
3
4
5b
6a
6
6b
7
7a
7b
7c
7d
7e

【図8】


8a
2
4
81
81
4
1
7a

【図10】



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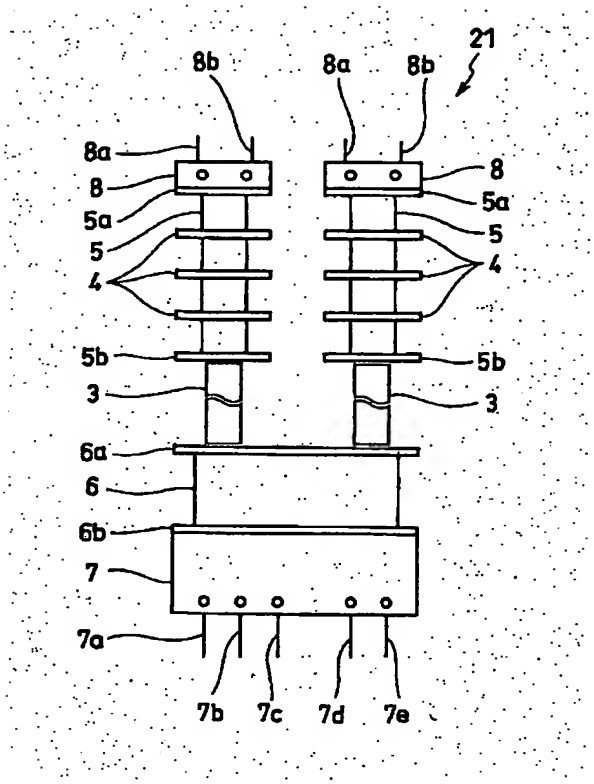
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8b
8a
8b
8a
8
5a
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5b
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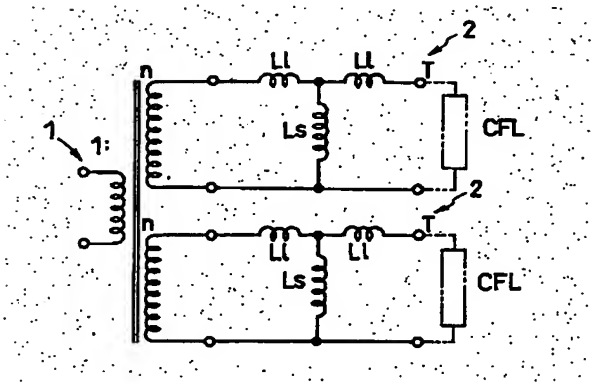
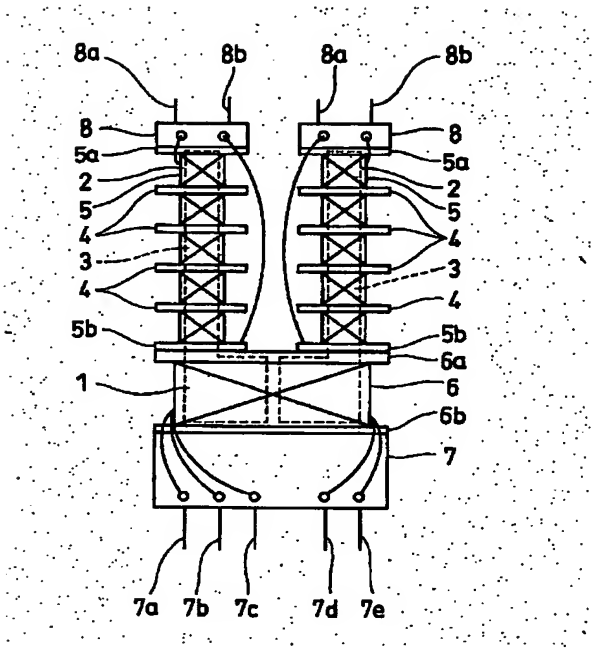
6
6b
7
7a
7b
7c
7d
7e

【図5】


2
LI
LI
T
Ls
CFL
1
1:
2
T
LI
LI
Ls
CFL

【図6】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8a
8b
8
5a
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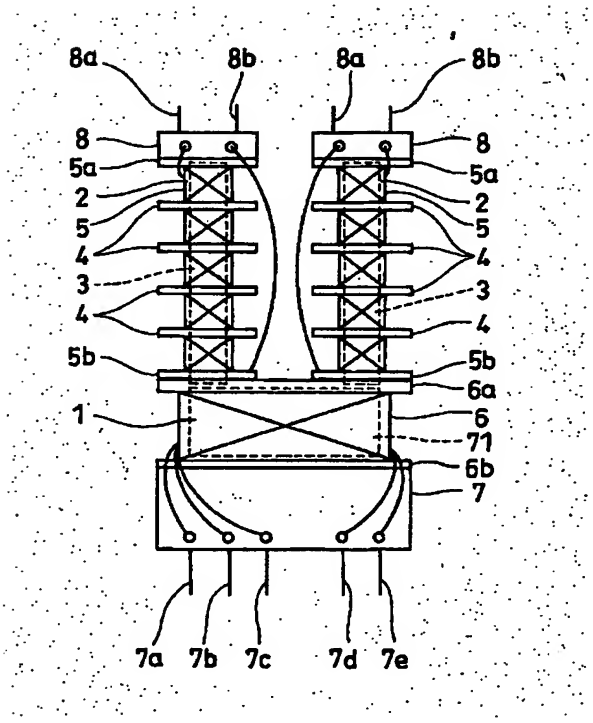
4
5b
1
8
5a
2
5
4
3
4
5b
6a
6
6b
7
7a
7b
7c
7d
7e

【図7】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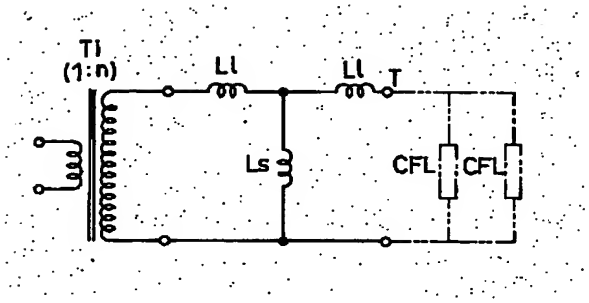
8b
8a
8b
8
5a
2
5
4
3
4
5b
1
8
5a
2
5
4
3
4
5b
6a
6
71
6b
7
7a
7b
7c
7d
7e

【図9】



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(71)Applicant : MINEBEA CO LTD

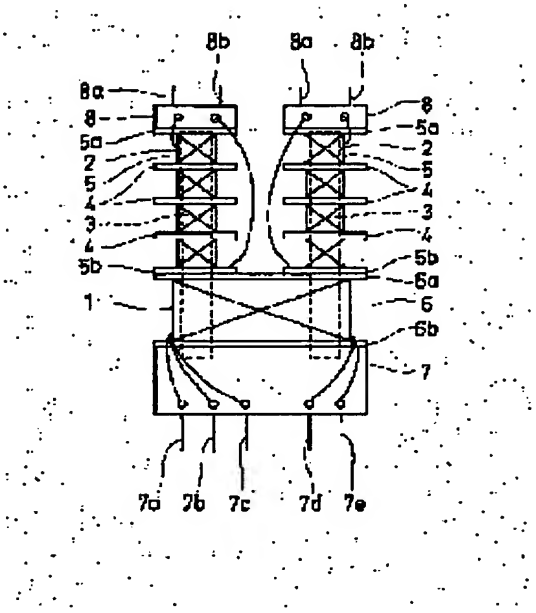
(72)Inventor : SUZUKI SHINICHI

(54) INVERTER TRANSFORMER

(57)Abstract:

PROBLEM TO BE SOLVED: To realize downsizing and cost reduction of an inverter transformer having a closed magnetic circuit structure which turns on a plurality of cold cathode lamps (has nor variation of discharging operation among a plurality of cold cathode lamps connected with a secondary winding).

SOLUTION: A secondary winding 2 are respectively wound around a plurality of separate and independent bar magnetic cores 3 and 3 which are electromagnetically connected with a primary winding 1 at the same characteristic, so that a plurality of secondary windings 2 and 2 which function mutually and independently and are equal electromagnetically and an open magnetic circuit structure can be obtained. In addition, according to the number of lamps, the primary winding 1 is common and only the secondary winding is added without increasing both the primary and secondary windings.



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[Date of extinction of right]

* NOTICES *

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3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Are in the inverter circuit which changes a direct current into an alternating current, and the alternating voltage inputted into the upstream is set to a pressure up or the inverter transformer which the pressure of is lowered and is outputted to secondary. It has two or more secondary coils and an upstream coil common to two or more of these secondary coils. A each second side coil The inverter transformer characterized by being wound around two or more cylindrical magnetic cores which are mutually combined with said common upstream coil in electromagnetism with an equal property, and which were formed separately independently respectively at each **.
[Claim 2] A secondary coil is an inverter transformer according to claim 1 characterized by being respectively wound in accordance with the shaft orientations of a cylindrical magnetic core, and being divided into two or more sections by the shaft orientations, and having a diaphragm between each section.
[Claim 3] Each cylindrical magnetic core is an inverter transformer according to claim 1 or 2 characterized by carrying out positioning immobilization to the upstream coil concerned so that it may be formed in L typeface, a secondary coil may be wound around the one side of them and it may combine with an upstream coil in electromagnetism by the whole other side side.
[Claim 4] The inverter transformer according to claim 1 to 3 characterized by meeting the winding shaft orientations of the secondary coil concerned, and for a magnetic plate approaching and arranging it in a wrap location only in an upstream coil, two or more secondary coils, or two or more secondary coils.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to an inverter transformer suitable as an object for inverter circuits which turns on the light source for screen lighting of a liquid crystal display.
[0002]
[Description of the Prior Art] Although a liquid crystal display (it is hereafter described as LCD.) has come to be widely used as display units, such as a personal computer, in recent years, this LCD needs the light source for screen lighting called a back light etc. Moreover, in order to maintain the screen of such LCD at high brightness, four or more cold cathode lamps (it is hereafter written as CFL.) are used as the above-mentioned light source, it may discharge to coincidence and it may be made to turn them on.
[0003] Generally, from about [12V] direct-current input voltage, using the ROIYA (ROYER) oscillator circuit, if it puts in another way, secondary [that] and the inverter circuit which generates 60kHz and about [1600V] high-frequency voltage are used for discharge of this kind of CFL, and lighting secondary [of an inverter transformer] at the time of discharge starting. This inverter circuit is controlled after CFL discharge to lower the secondary electrical potential difference of an inverter transformer to an about [600V] electrical potential difference required for the maintaining a discharge of CFL. This armature-voltage control is usually performed by PWM (pulse width modulation) control.
[0004] As an inverter transformer used for such an inverter circuit, there are a thing of open magnetic circuit structure which used the cylindrical core for the magnetic core, and a thing which made the magnetic core closed magnetic circuit structure from the former.
[0005] Drawing 9 is drawing showing the equal circuit of the inverter transformer of open magnetic circuit structure. In this drawing, a leakage inductance and Ls of the pressure-up ideal transformer which is 1:n in which Ti does not have loss, and Ll are the inductances of a secondary coil. By the inverter transformer of illustration open magnetic circuit structure, when CFL connected is one, the leakage inductances Ll and Ll play the role of a ballast inductance, and the voltage drop of the inverter transformer output terminal T does not have them, either, and they discharge normally. However, since the leakage inductances Ll and Ll are large when two CFL(s) are connected, if one of CFL(s) discharges previously, the electrical potential difference of an output terminal T will descend, and CFL of another side will serve as discharge impossible.
[0006] the inverter transformer (not shown) of the closed magnetic circuit structure where the inverter transformer of the open magnetic circuit structure which used the cylindrical core for the magnetic core is constituted as shown in drawing 10 , and it must be formed in the configuration which closed the magnetic core, for example, a square, and a coil must be made to wind around the magnetic core -- comparing -- structure -- it is easy. However, since there is no change in being open magnetic circuit structure and it cannot avoid the phenomenon of the CFL discharge impossible mentioned above to it, one inverter transformer is needed for it to one CFL.
[0007] Therefore, in using CFL of the number beyond 4 or it as in the screen lighting in LCD corresponding to high brightness which was mentioned above, four or more inverter transformers are needed. For this reason, while the whole inverter transformer was enlarged, there was a problem that cost went up.

[0008] On the other hand, if it is in some which made the magnetic core closed magnetic circuit structure, it is possible to connect two or more CFL(s) to one inverter transformer, and to make all those CFL(s) discharge. However, with closed magnetic circuit structure, if which CFL discharges in this case, the discharge current flows by the fall of that internal impedance of CFL and the load current increases, although a leakage inductance is small, the output terminal electrical potential difference of an inverter transformer will fall. For this reason, the discharge conditions of other CFL (s) are affected and each discharge actuation of CFL may be made to produce dispersion.
[0009] Moreover, since the impedance of CFL has negative resistance characteristics, when one CFL discharges and lights up, the impedance of CFL decreases rapidly, a current increases rapidly, and damage on inverter transformers, such as an open circuit of a coil, may be produced.
[0010] As a method of coping with that the fall of the output terminal electrical potential difference of the inverter transformer of closed magnetic circuit structure affects the discharge conditions of other CFL(s), as shown in drawing 11 , there is the approach of inserting the ballast capacitor Cb between an output terminal T and each CFL. However, while phase contrast arises on an electrical potential difference and a current by the inserted ballast capacitor Cb and reducing power efficiency remarkably, the increment in the number of components and a cost rise are made to invite by this approach.
[0011]
[Problem(s) to be Solved by the Invention] By the conventional inverter transformer, as mentioned above, if it was in the thing of open magnetic circuit structure, the number of an inverter transformer increased with the number of CFL, and the relation of 1 to 1, and it enlarged as the whole inverter transformer, and there was a trouble that cost went up.
[0012] Moreover, although two or more CFL(s) might be made to discharge by one inverter transformer if it was in the thing of closed magnetic circuit structure, discharge actuation was made to produce dispersion between CFL(s), and there was a trouble of damaging an inverter transformer according to an overcurrent.
[0013] Although there is the coping-with method for inserting the ballast capacitor Cb in a serial at each CFL about dispersion in the discharge actuation between CFL(s), according to this, the new trouble of decline in power efficiency and increase of the number of components or cost was produced.
[0014] This invention aims at offering the inverter transformer which all the above-mentioned troubles in closed magnetic circuit structure can be canceled upwards, and there is no increment in the number due to the number of CFL and 1 to 1, can also miniaturize a whole configuration compared with the thing of the conventional open magnetic circuit structure, and can also suppress the rise of cost, though it is open magnetic circuit structure.
[0015]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention according to claim 1 Are in the inverter circuit which changes a direct current into an alternating current, and the alternating voltage inputted into the upstream is set to a pressure up or the inverter transformer which the pressure of is lowered and is outputted to secondary. It has two or more secondary coils and an upstream coil common to two or more of these secondary coils, and is characterized by winding a each second side coil around two or more cylindrical magnetic cores which are mutually combined with said common upstream coil in electromagnetism with an equal property and which were formed separately independently respectively at each **.
[0016] In invention according to claim 1, a secondary coil is respectively wound in accordance with the shaft orientations of a cylindrical magnetic core, and is divided into two or more sections by the shaft orientations, and invention according to claim 2 is characterized by having a diaphragm between each section.
[0017] It is characterized by carrying out positioning immobilization to the upstream coil concerned so that each cylindrical magnetic core may be formed in L typeface, a secondary coil may be wound around the one side of them in invention according to claim 1 or 2 and invention according to claim 3 may be combined with an upstream coil in electromagnetism by the whole other side side.
[0018] Invention according to claim 4 is characterized by meeting the winding shaft orientations of the secondary coil concerned, and for a magnetic plate approaching and arranging it in a wrap

location only in an upstream coil, two or more secondary coils, or two or more secondary coils, in invention according to claim 1 to 3.

[0019] In invention according to claim 1, it has two or more secondary coils which have an equal property mutually, and an upstream coil is considering as a thing common to the secondary coil of these plurality, a whole configuration is miniaturized compared with the conventional inverter transformer equipped with two or more (same number) upstream coils and secondary coils, and the rise of cost is also suppressed. Moreover, since open magnetic circuit structure is taken in this invention, all troubles, such as decline in the trouble in closed magnetic circuit structure, for example, dispersion of the discharge actuation between CFL(s) connected to the each second side coil, and the power efficiency by adding a ballast capacitor and increase of the number of components, are canceled.

[0020] In invention according to claim 2, the diaphragm between each section contributes to maintenance of the creeping distance to need, and functions on creeping-discharge inhibition.

[0021] By invention according to claim 3, it combines with an upstream coil in electromagnetism by the whole other side side of the cylindrical magnetic core of L typeface by which the secondary coil was wound around the one-side side. Thereby, at the edge of a cylindrical magnetic core, compared with the case where it combines with an upstream coil in electromagnetism, the amount of magnetic flux from the upstream coil which a secondary coil receives increases, and a high increase in power is only carried out.

[0022] In invention according to claim 4, adjustment of the magnitude of a leakage inductance is attained by setup of the magnetic plate which a wrap location is approached and is arranged only in an upstream coil, two or more secondary coils, or two or more secondary coils.

[0023]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. Drawing 1 is the whole block diagram showing the 1st operation gestalt of the inverter transformer by this invention. A cylindrical magnetic core is used and the inverter transformer of this invention has the open magnetic circuit structure where the secondary coil was wound around the cylindrical magnetic core so that it may mention later. In drawing 1 , 1 is an upstream coil and 2 is a secondary coil. It had two secondary coils 2 and they have combined the upstream coil 1 with this upstream coil 1 in electromagnetism respectively as a common upstream coil plurality and here.

[0024] That is, the each second side coils 2 and 2 consist of a ferrite which is soft magnetic materials, are wound around the cylindrical magnetic cores 3 and 3 arranged in parallel at each **, and have combined the cylindrical magnetic cores 3 and 3 with the common upstream coil 1 in electromagnetism.

[0025] In this case, it has combined with the upstream coil 1 and mutual in electromagnetism with an equal property, and each cylindrical magnetic cores 3 and 3 are formed separately independently respectively. Therefore, the each second side coils 2 and 2 also function as a secondary coil which became independent mutually, and are equivalent in electromagnetism.

[0026] Here, although the above-mentioned secondary coils 2 and 2 are wound in accordance with the shaft orientations of the cylindrical magnetic cores 3 and 3, since the high voltage is generated, it is divided into two or more sections by the shaft orientations, the insulating diaphragm 4 is formed between each section, and the creeping distance required for inhibition of creeping discharge is held.

[0027] The each second side coil 2 is wound around the periphery of the tubed bobbin 5 in fact, and the cylindrical magnetic core 3 is inserted in the way among the bobbin 5. The upstream coil 1 is also wound around the tubed bobbin (bobbin for upstream coils) 6, and this bobbin 6 for upstream coils is formed in that inner direction with the bore which can insert the drawing Nakashita edge part of the cylindrical magnetic cores 3 and 3. Moreover, brim board 5a, 5b;6a, and 6b are prepared in the both-ends side of each bobbins 5 and 6.

[0028] Positioning immobilization of the cylindrical magnetic cores 3 and 3 is carried out in the part of the method of the inside of the bobbin 6 for upstream coils equivalent in electromagnetism so that it may combine with the upstream coil 1 and mutual in electromagnetism with an equal property. Moreover, as for the part of the remainders other than the part to which each cylindrical magnetic cores 3 and 3 are located in the bobbin 6 for upstream coils, the secondary coils 2 and 2 are

respectively located in the wound bobbin 5 for secondary coils, and 5. While electromagnetic-like association with the upstream coil 1 of the secondary coils 2 and 2 which were mentioned above is realized by this, the each second side coils 2 and 2 are made with a thing equivalent in electromagnetism.

[0029] ** of the upstream coil 1 and termination are connected to the terminal pins 7a-7e by which support immobilization was carried out at the terminal block 7 for upstream coils. Moreover, ** of the each second side coils 2 and 2 and termination are respectively connected to the terminal pins 8a and 8b by which support immobilization was carried out at the terminal block 8 for secondary coils. The above-mentioned terminal blocks 7 and 8 consist of an insulating material, and are respectively attached in the most distant mutually location between which 1 and the bobbins 5 and 6 for secondary coils were made to be placed.

[0030] In addition, drawing and drawing 3 which show the part (coil inclusion base 21) excluding the upstream coil 1 and the secondary coils 2 and 2 from the inverter transformer of this invention which shows drawing 2 to drawing 1 are the exploded view, and the same sign as drawing 1 shows the same part in these drawing 2 and drawing 3 . Each coils 1, 2, and 2 are incorporated as shown in such a coil inclusion base 21 at drawing 1 .

[0031] If the example of a circuit which connected CFL (load) to the inverter transformer of above-mentioned this invention is shown, it will be as drawing 4 . In drawing 4 , the inverter transformer 41 of this invention constitutes an inverter circuit from a switching circuit 42. The inverter transformer 41 carries out the pressure up of the high-frequency voltage impressed to the common upstream coil 1, discharges and makes them to impress it to two CFL(s) connected to the secondary coils 2 and 2, and turn on with this configuration. In addition, in this drawing 4 , resistance, and Q1 and Q2 are transistors, and, as for an inductance, and R1 and R2, L constitutes the above-mentioned switching circuit 42.

[0032] Drawing 5 is drawing showing the equal circuit of the inverter transformer 41 in drawing 4 , and the same sign as drawing 9 shows the same or a considerable part in this drawing 5 . According to the inverter transformer 41 of this invention prepared in the inverter circuit as shown in drawing 4 , although the each second side coils 2 and 2 make the upstream coil 1 common, they become independent mutually, and are equivalent in electromagnetism so that it may understand from the equal circuit shown in this drawing 5 . That is, each CFL serves as circuitry respectively connected through the separate leakage inductances Ll and Ll (secondary coil 2).

[0033] Therefore, even if one of CFL(s) discharges previously, the output voltage (electrical potential difference of an output terminal T) of the secondary coil 2 of another side does not descend (the discharge conditions of CFL of another side are not affected). That is, without using the ballast capacitor Cb (referring to drawing 11), it discharges and CFL of another side may be made to turn on normally after discharge of one CFL, and lighting.

[0034] In addition, although the above-mentioned implementation gestalt described the case where two secondary coils 2 were formed, it is not limited only to this, but three or more are prepared, and you may make it connect CFL to the each.

[0035] Moreover, with the above-mentioned implementation gestalt, although each cylindrical magnetic cores 3 and 3 were formed in the shape of [mere] a rod (I-shape), this may be respectively formed in L typeface, as shown in drawing 6 . In this case, the secondary coil 2 is wound around one side (longitudinal side) of L typeface, and where each end face by the side of the other sides of the cylindrical magnetic cores 3 and 3 is opposed mutually, positioning immobilization is carried out to the upstream coil 1, so that it may combine with the upstream coil 1 in electromagnetism in the whole other sides (sideways side).

[0036] According to this configuration, compared with the case where it is shown in drawing 1 combined with the upstream coil 1 in electromagnetism, the amount of magnetic flux from the upstream coil 1 which the secondary coils 2 and 2 receive increases, and a high increase in power is carried out at the edge of the magnetic cores 3 and 3 of the shape of a mere rod.

[0037] Furthermore, although electromagnetic-like association with the above-mentioned implementation gestalt, and the cylindrical magnetic cores 3 and 3 (secondary coils 2 and 2) and the upstream coil 1 was performed in inserting and locating the lower limit part of each cylindrical magnetic cores 3 and 3 in the bobbin 6 for upstream coils, it is not limited only to this. For example,

as shown in drawing 7 , the secondary magnetic core 71 is inserted and located in the bobbin 6 for upstream coils, and it may be made to perform the above-mentioned electromagnetic-like association by making the lower limit side of each cylindrical magnetic cores 3 and 3 counter the end face of this secondary magnetic core 71.

[0038] Moreover, if it is not limited to specific configurations, such as a round shape, about the cross-section (cross section) configuration of the cylindrical magnetic core 3 and can insert into a bobbin 5 at least, configurations of arbitration, such as a rectangle and an ellipse form, are selectable. Usually, the cross-section configuration of the cylindrical magnetic core 3 and the cross-section configuration of the magnetic core insertion section of a bobbin 5 are made by the shape of isomorphism.

[0039] Furthermore, you may approach and the magnetic plates 81 and 81 which become a wrap location from a ferrite etc. in accordance with the winding shaft orientations (drawing Nakagami down) of the secondary coils 2 and 2 concerned about the secondary coils 2 and 2 may be arranged again so that it may illustrate to drawing 8 . According to this configuration, by setup of the magnetic plates 81 and 81 arranged at 2 or about 2 secondary coil, adjustment of the magnitude of the leakage inductance Ll is attained, and the adjustment of the discharge conditions of CFL of it is attained.

[0040] in addition, drawing which looked at drawing 8 from the left of drawing 1 -- it is -- the magnetic plate 81 -- the secondary coil 2 and 2 order side -- a wrap -- although the case where pair arrangement is carried out like is illustrated -- further -- the right-and-left side (both-sides side) of the secondary coils 2 and 2 -- a wrap -- you may constitute like. In this case, magnetic plate 81 -- Spacing with the secondary coils 2 and 2 etc. is set up so that a high-pressure short circuit may not occur from the secondary coils 2 and 2 by arrangement.

[0041] Moreover, the magnetic plate 81 may be constituted so that not only the secondary coils 2 and 2 but the upstream coil 1 may be covered. In this case, since the upstream coil 1 and the secondary coils 2 and 2 serve as close coupling, the wrap range etc. is set up in the upstream coil 1 with the magnetic plate 81 so that the leakage inductance Ll may decrease extremely and discharge of CFL may not be affected.

[0042] In addition, the cross-section configuration of the magnetic plate 81 may also be what kind of configuration, if the magnitude adjustment function of the leakage inductance Ll with this magnetic plate 81 is not lost.

[0043]

[Effect of the Invention] As stated above, in this invention, two or more cylindrical magnetic cores which are mutually combined in electromagnetism in an equal property to a common upstream coil and which were formed separately independently respectively were prepared in the inverter transformer to which two or more loads (CFL etc.) are connected. And it functioned independently mutually by winding a secondary coil around two or more of these cylindrical magnetic cores respectively, and we obtained two or more secondary coils equivalent in electromagnetism, and decided to connect two or more loads to each ** at two or more of these secondary coils.

[0044] According to this, it is effective in the inverter transformer which operates two or more loads, without affecting it mutually having a small whole configuration compared with the thing of the conventional open magnetic circuit structure, and being obtained by low cost, without [therefore] increasing due to the number of a load, and 1 to 1.

[0045] Moreover, since the inverter transformer of this invention has taken the open magnetic circuit structure which wound the secondary coil around the cylindrical magnetic core, it is effective in the ability of all of the trouble in closed magnetic circuit structures by adding dispersion and the ballast capacitor of the discharge actuation between the loads connected to the each second side coil, such as decline in power efficiency, and increase of the number of components, to be solved.

[Translation done.]

* NOTICES *

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2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the whole block diagram showing 1 operation gestalt of the inverter transformer by this invention.
[Drawing 2] It is drawing showing the coil inclusion base of the inverter transformer shown in drawing 1 .
[Drawing 3] It is the exploded view of drawing 2 .
[Drawing 4] It is drawing showing the example of a circuit which connected CFL to the inverter transformer shown in drawing 1 .
[Drawing 5] It is drawing showing the equal circuit of the inverter transformer in drawing 4 .
[Drawing 6] It is drawing showing other operation gestalten (the 1) of this invention.
[Drawing 7] It is drawing showing other same operation gestalten (the 2).
[Drawing 8] It is drawing showing other same operation gestalten (the 3).
[Drawing 9] It is drawing showing the equal circuit of the inverter transformer of the conventional open magnetic circuit structure.
[Drawing 10] It is drawing showing the inverter transformer of the conventional open magnetic circuit structure where the cylindrical core was used for the magnetic core.
[Drawing 11] It is drawing showing the circuit which connected the ballast capacitor to the inverter transformer of closed magnetic circuit structure, and enabled discharge of two CFL(s).
[Description of Notations]
1 Upstream Coil
2 Secondary Coil
3 Cylindrical Magnetic Core
4 Diaphragm
41 Inverter Transformer
42 Switching Circuit
81 Magnetic Plate
CFL Cold cathode lamp (load)
0

[Translation done.]

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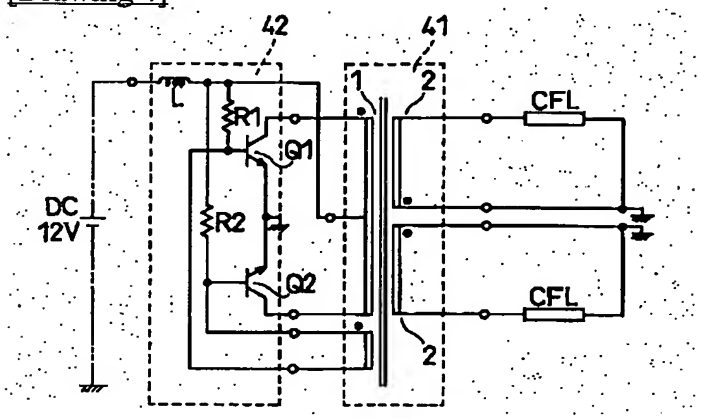
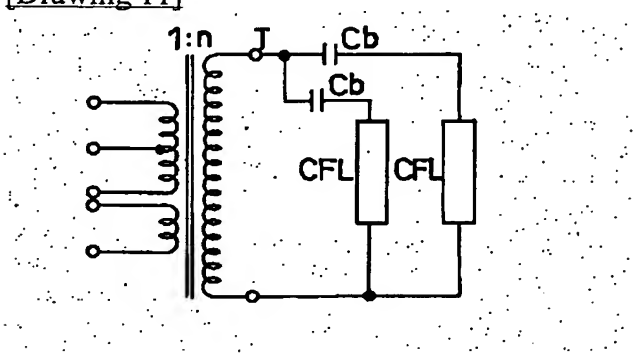
DRAWINGS

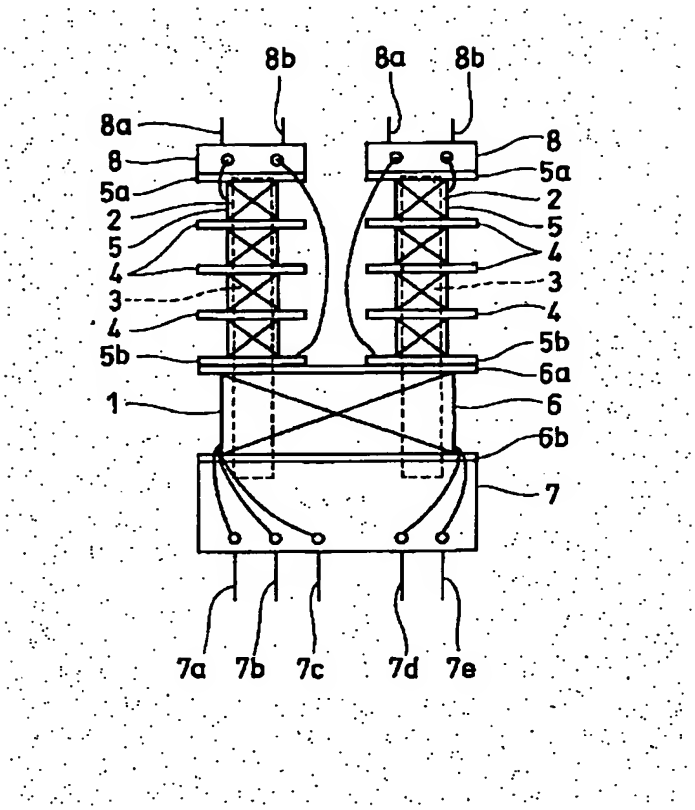
[Drawing 4]



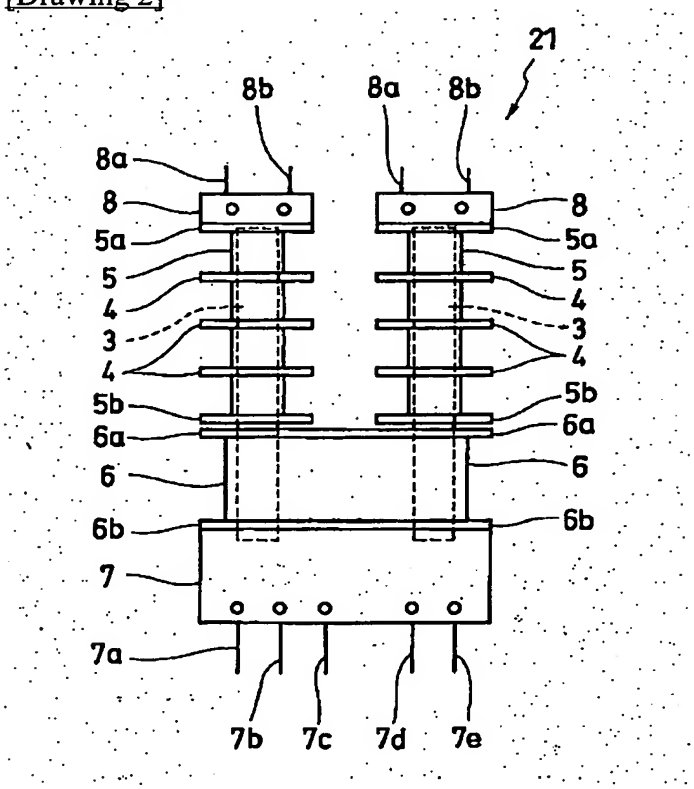
[Drawing 11]



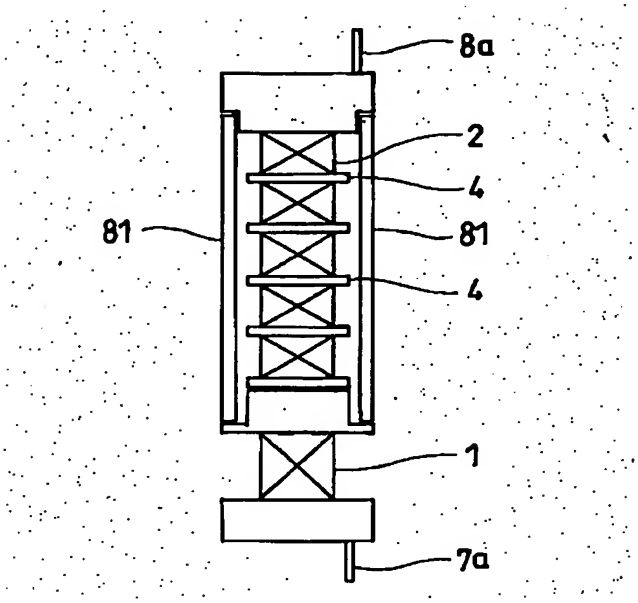
[Drawing 1]



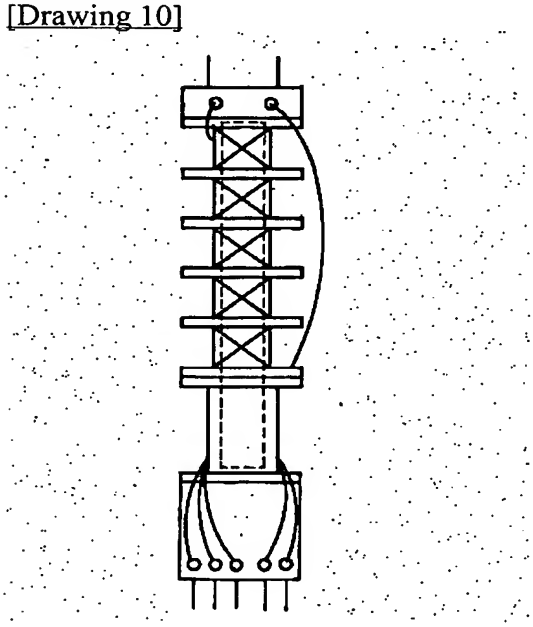
[Drawing 2]



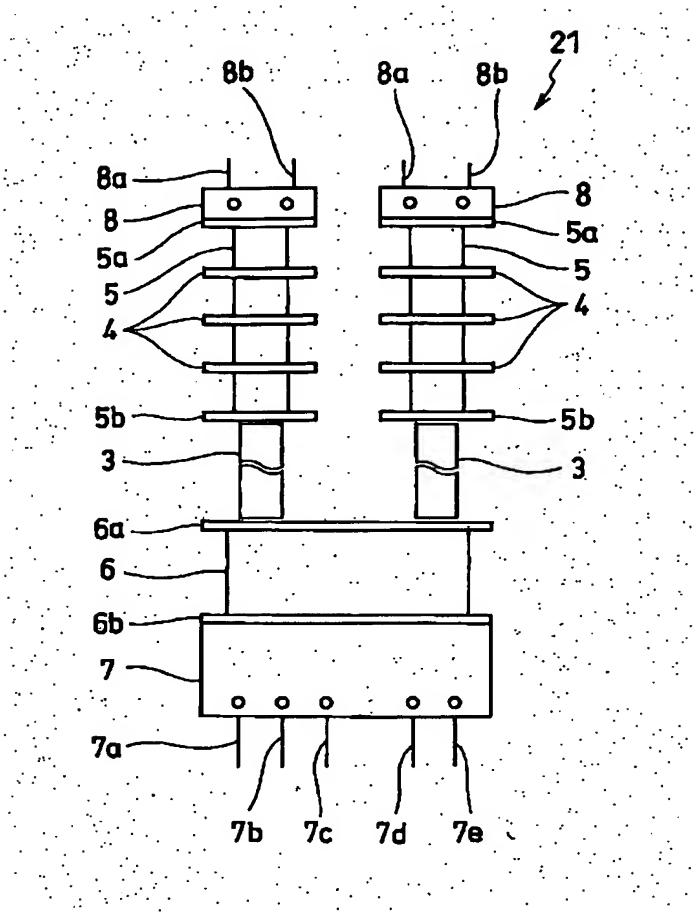
[Drawing 8]



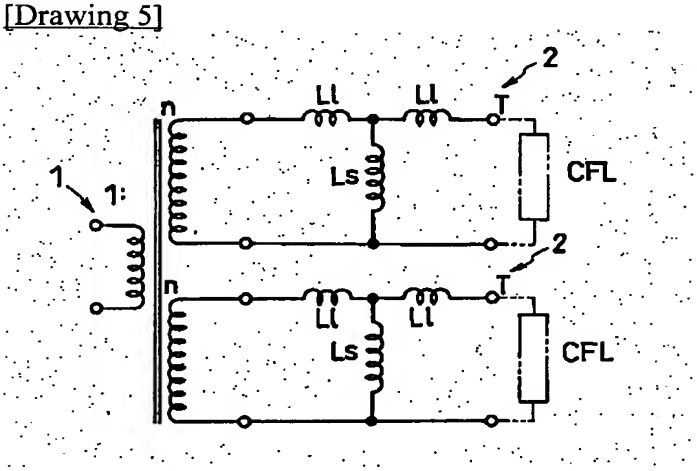
[Drawing 10]



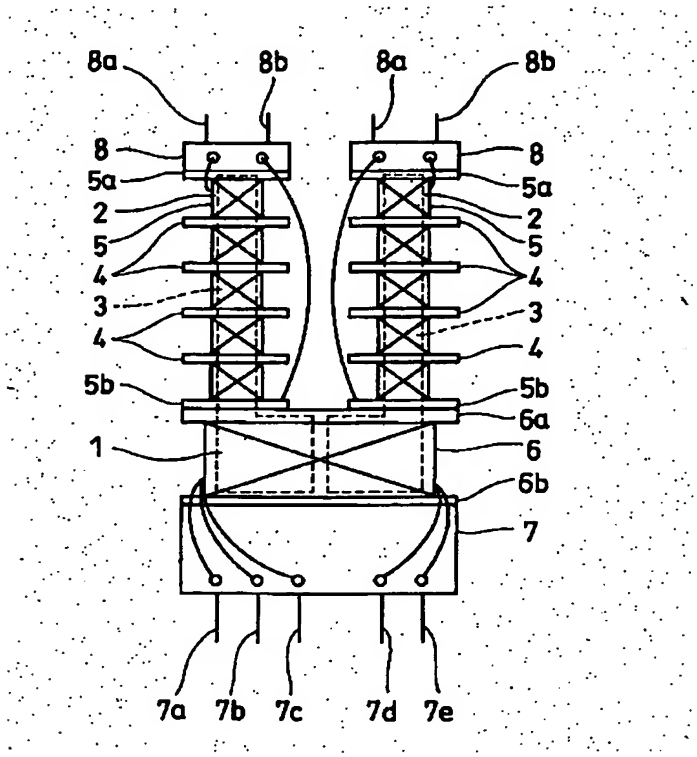
[Drawing 3]



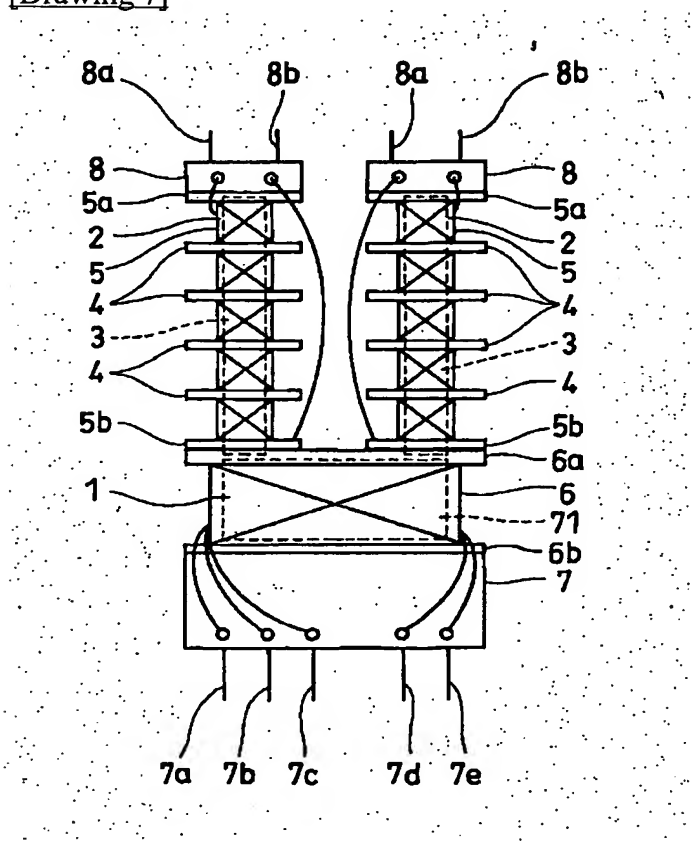
[Drawing 5]



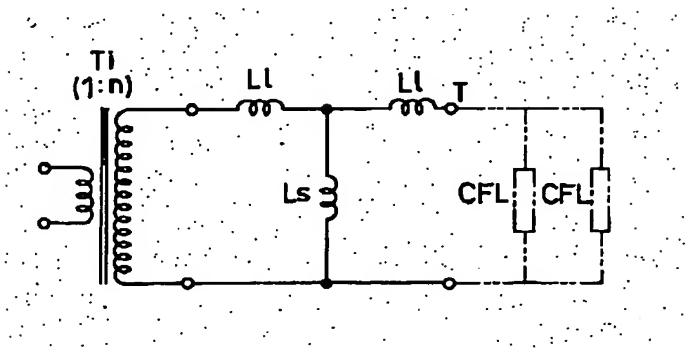
[Drawing 6]



[Drawing 7]



[Drawing 9]



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